COSINE LITE PAPER

A Dynamic Layer-2 Protocol for Trust, Security, and Real-Time Credit Scoring in Decentralized Finance

Author: Dimoris Chinyui
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Introduction

The rise of decentralized finance (DeFi) has opened new doors for global financial inclusion and innovation. Users can lend, borrow, trade, and participate in sophisticated financial instruments without traditional intermediaries. Yet, the freedom and openness of DeFi have also made it vulnerable to large-scale fraud and exploitation. Recent data suggest:

- Over **100 billion USD** in total losses have been recorded across DeFi platforms worldwide.[1]

- Common forms of fraud include **rug pulls**, **pig butchering** scams, **protocol exploits**, malicious social engineering, and unscrupulous contract deployments.

- Under-collateralized lending protocols alone have incurred around **150 million USD** in defaults due to the difficulty of accurately assessing borrower trustworthiness.

Such losses erode user confidence and prevent mainstream adoption. Many potential participants fear losing their funds and find it difficult to trust systems that have no robust or universally accepted measure of user credibility. Insecure ecosystems tend to attract more speculation than genuine, utility-driven transactions, thus fueling volatility and limiting real-world adoption of digital assets.

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[1]Estimates aggregated from multiple sources such as Reuters, Wired, and various DeFi audit reports.

Our solution is COSINE, a Layer-2 (L2) protocol designed to provide:

- **An adaptive and evolving security framework** that mitigates fraud in real time, across multiple blockchains.

- **Dynamic credit scoring** to enable more secure undercollateralized lending, allowing reputable users to be rewarded with financial access while discouraging malicious activities.

- **A global trust layer** that fosters tangible, everyday use of digital currencies in commerce and banking services, rather than mere speculation.

By addressing key security gaps, COSINE aims to transform DeFi into a stable, trusted environment suitable for individuals and institutions seeking long-term investments and tangible adoption.

1   Current Challenges in DeFi

1. Rampant Fraud and Scams

From **rug pulls**—where project creators abandon a token after collecting funds—to sophisticated **protocol exploits** that drain liquidity pools, fraud in DeFi is widespread. Attackers exploit the transparency and composability of smart contracts to identify vulnerabilities, leaving legitimate users unprotected.

2. Under-Collateralized Lending Risks

Undercollateralized loans or "zero-collateral" lending have repeatedly failed because of minimal checks on borrower reliability. Many solutions rely on complicated off-chain credit references, or demand highly volatile collateral, failing to solve the core problem of risk assessment.

3. Cross-Chain Vulnerabilities

Attacks often stretch across multiple blockchains, using bridging services and multiple "hops" of transactions to launder funds. Most existing fraud prevention systems are siloed, focusing on a single chain and ignoring suspicious movements elsewhere.

4. Lack of Adaptive Defense

Threats evolve rapidly. Traditional systems that rely on static thresholds or manual updates cannot keep up, leaving long windows of vulnerability. DeFi's open, fast-paced nature amplifies these risks.

5. Missing Global Trust Layer

Without a universal, on-chain measure of trustworthiness, lenders hesitate to offer credit to unknown parties, and mainstream users remain wary. DeFi thus misses out on the utility and broad adoption that stable trust mechanisms could provide.
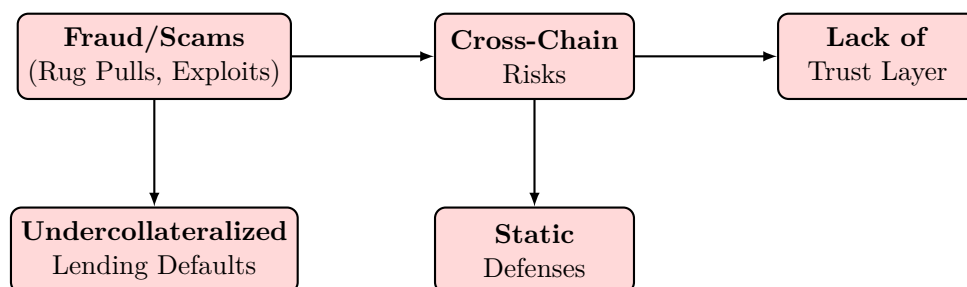

Figure 1: Figure 1: Common Security Gaps and Trust Deficiencies in DeFi

2 The COSINE Approach

A Transformative Layer-2 Protocol

COSINE operates on top of major blockchains, unifying data to create a global measure of trust. It continuously *adapts* via real-time updates, almost like a neural network learning from each new event.

- **Dynamic Credit Scoring:** Every wallet's credit score changes incrementally with transactions, votes, and risk signals, enabling on-chain, trustless underwriting for undercollateralized loans.

- **Fraud Prevention Across Chains:** Suspicious activity on one chain triggers partial penalties for related wallets on all linked chains, thus preventing laundering or exploit "hopping."

- **Self-Tuning Security:** The protocol automatically adjusts the weight of penalties and rewards over time, ensuring the system is neither too lenient nor too strict, even as attacker strategies evolve.

Why This Matters

- **Restoring Confidence:** By making DeFi safer, we encourage new users and businesses to transact with digital assets, increasing everyday use.

- **Catalyzing Real Adoption:** Enhanced security and a credible global credit score facilitate everyday payments, cross-border lending, and real-world commerce.

- **Boosting Investment:** Financial institutions see better ROI potential in an ecosystem protected by robust security, reducing the risk of catastrophic hacks and defaults.

3 Intelligent, Adaptive Blockchain Layer

COSINE could be called an *intelligent blockchain* because it continuously refines its own parameters. This is akin to the way AI-based systems learn from data in real time, but here it is realized through decentralized consensus rather than a centralized model.

Key Adaptive Components

- **Real-Time EMAs (Exponential Moving Averages):** The protocol tracks rolling averages of voting behavior, penalty effectiveness, and transaction anomalies.

- **Feedback Loops for Scaling:** If negative penalties are too harsh (or too mild), COSINE's internal feedback system readjusts future penalty magnitudes to maintain balance.

- **Sequential Updates:** Rather than waiting for large voting windows, the protocol updates scores on each relevant event, minimizing latency and staying in sync with evolving on-chain conditions.
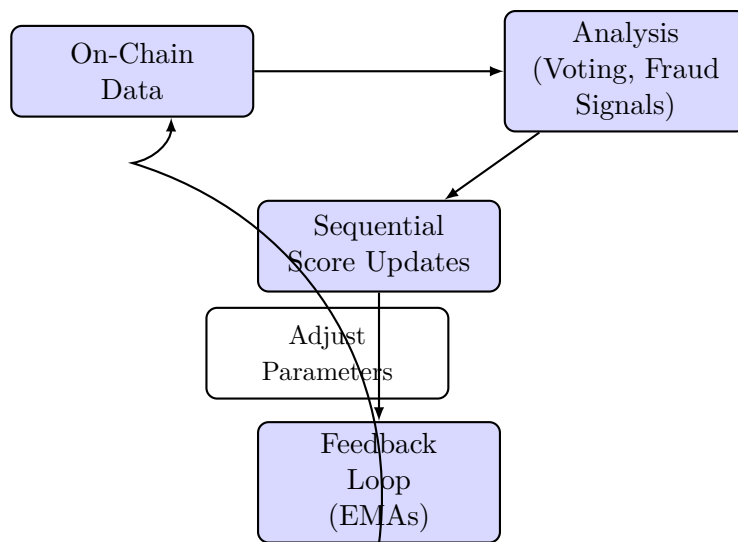

Figure 2: Figure 2: COSINE's Adaptive Learning Cycle

4   Security and Fraud Detection

Random Time Windows & Multi-Hop Analysis

To counter money laundering and hidden exploit flows:

- The protocol selects random time intervals during which it checks wallet connections and transaction "hops," making it hard for attackers to predict when or how they might be flagged.

- If a malicious address sends or receives funds through multiple intermediary addresses, COSINE identifies these links up to a certain hop depth, applying partial penalties to related wallets that appear *unusually active* in suspicious clusters.

Partial Blacklisting and Rehabilitation

- **Partial Blacklisting:** Instead of a permanent ban, wallets receive incremental penalties that reduce their credit scores proportionally to the severity and frequency of suspicious activity.

- **Rehabilitation:** If subsequent evidence shows a wallet is not malicious, or if many high-reputation users cast positive votes over time, the wallet's score can rebound. This flexible system avoids irreversible "one-strike" situations.

Creating New Wallets to Evade Penalties

Malicious actors might attempt to abandon a penalized wallet and open a fresh address in order to bypass negative scores. COSINE mitigates this risk through:

- **Cross-Chain Linking and Association**: Wallets that previously interacted with malicious addresses or are found to be linked through multi-hop transfers can still inherit partial penalties. This applies even if the user tries to start anew on a different blockchain or with a new address.

- **Random Time Windows**: Because COSINE analyzes transaction patterns in randomly selected future intervals, malicious actors cannot be sure their new address won't be flagged for older suspicious links.

- **Voting Restrictions**: If a wallet is penalized for suspicious activity, it cannot vote to rehabilitate or "whitewash" its associated addresses, preventing malicious collusion.

5   Community Governance and Voting

Reputation-Weighted Votes

All users can vote to flag or endorse particular addresses. Each voter has a **reputation score** ranging from 0 to 1. Users who consistently vote in line with the final consensus gain higher reputation, amplifying their future votes. Conversely, repeated disagreement reduces a user's reputation.

Sequential, Ongoing Voting

Unlike typical snapshot voting, COSINE employs **sequential voting**, which means:

- Each vote triggers a small adjustment to the target wallet's credit score in near real time.

- Over many votes, the wallet's score can move significantly up or down, reflecting the cumulative community stance.

- This approach remains efficient and scalable because each event is processed individually, rather than waiting for large batch computations.
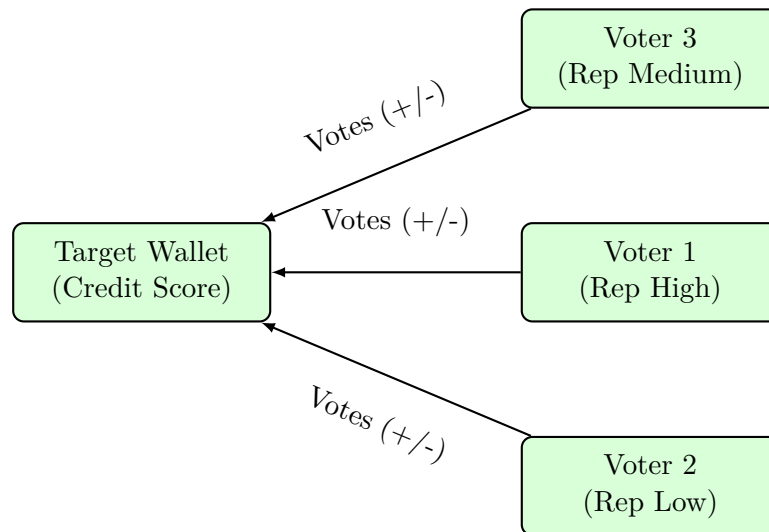
Figure 3: Figure 3: Example of Reputation-Weighted Voting

6 Credit Score Verification and Cosine Similarity

Intuitive Trust Assessment

Rather than presenting a single numeric score that can be misleading or swing dramatically, COSINE uses a short vector representation. The final step in verifying a wallet's trustworthiness is to **compute the cosine similarity** between:

- **The wallet's vector** (derived from its normalized credit score data).

- **A chosen threshold vector** (representing the minimum acceptable trust).

A similarity value close to 1 indicates a trustworthy wallet. This approach better captures the nuanced, *relative* nature of trust.

Why Cosine Similarity?

- **More Stable**: Raw numbers can be volatile; vector comparisons dampen sudden, small fluctuations.

- **Comparative Approach**: Lenders or partners can compare a wallet's vector to a well-known, "gold-standard" trustworthy wallet or threshold, obtaining a clear picture of how close the wallet is to a desired level of reliability.

7 Use Cases and Ecosystem Opportunities

1. Global Lending

- Lenders on any chain can check a user's COSINE credit score before extending under-collateralized loans, significantly reducing default risks.

- Traditional banks could integrate with COSINE to lend crypto or even stable assets to creditworthy individuals worldwide.

2. Secure Commerce

Merchants can use **cosine similarity checks** to decide whether to accept large payments from certain wallets. This fosters a safer environment for high-value digital asset transactions.

3. Lowering Barriers to Entry

Entrepreneurs with sufficient capital can build new lending platforms or DeFi services on COSINE's backbone. They immediately benefit from the existing credit scoring and anti-fraud infrastructure without building it from scratch.

4. Cross-Chain Identity Linking

Users can link multiple addresses across different blockchains to a single COSINE wallet, consolidating their on-chain reputations. Malicious actors attempting to open "clean" new addresses get penalized if the new address is traced back to known bad wallets.

8 Token Usage and Fee Structure

COSINE Token Fundamentals

- **Total Supply:** 1,000,000,000 tokens.

- **Staking for Validators:** A minimum of **100,000** tokens is required for a validator to participate in securing the network and processing updates.

- **Validator Rewards:** Validators receive token rewards from a designated network pool for honest, accurate participation.

Preventing Spam and Preserving Value

1. **Cost Accumulation:** Each time a wallet's credit score is updated (due to votes, fraud detection events, or association analyses), network rewards are paid out to validators on behalf of that wallet. These costs accrue in an internal ledger.

2. **Verification Fee:** When anyone requests an *official on-chain verification* of a wallet's credit score (e.g., a lender checking a borrower), the requesting party pays a fee in COSINE tokens that corresponds to the accumulated cost. These tokens are then **burned**.

3. **Sustainability:** Because the fee is burned, it offsets the tokens initially emitted as validator rewards, helping stabilize token supply. It also ensures that verification is not exploited for spam or denial-of-service attacks.

9 Tokenomics and Vesting

Token Distribution

- **Foundation & Core Team (10%):** 4-year vesting with a 1-year cliff; linear monthly unlock thereafter.

- **Advisors & Contributors (5%):** 2-year vesting, shorter cliff or linear monthly unlock.

- **Early Developer/Builder Grants (10%):** Released upon hitting milestone targets to encourage ecosystem growth.

- **Private Sale / Presale (15%):** 6–12 months lock, then linear unlock over 6–12 months.

- **Public Sale (20%):** Unlocked at Token Generation Event (TGE).

- **Network Rewards & Ecosystem Funds (40%):** Reserved for validator compensation and long-term project initiatives over 5–8+ years.

Multi-Chain Strategy

COSINE tokens live on different blockchains (like Ethereum, Solana, etc.) through a lock-and-mint bridging model. The *total supply remains constant* across all chains, and market arbitrage helps keep prices consistent.
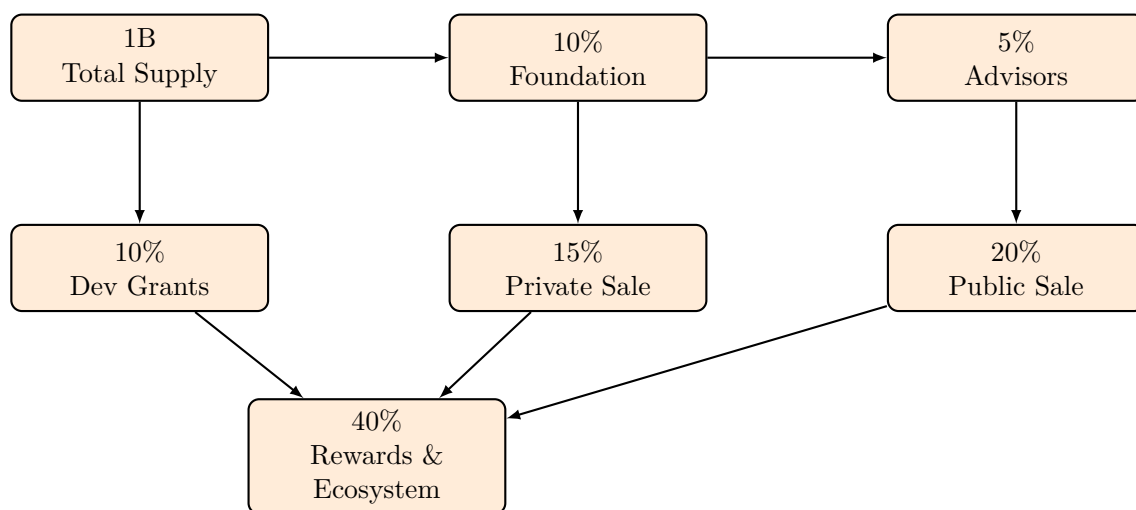
Figure 4: Figure 4: COSINE Token Allocation Overview

10 Roadmap

Phase 1: Early Launch (0–6 Months)

1. **Core Protocol & MVP:** Launch the fundamental features (dynamic scoring, validator selection) on an Ethereum testnet.

2. **Presale & Public Sale:** Conduct token sales; list the token on at least one major DEX.

3. **Developer SDKs & Community Bootstrapping:** Release toolkits and engage early community members, testers, and advisors.

Phase 2: Cross-Chain Deployment (6–12 Months)

1. **Bridging Contracts:** Extend COSINE to other blockchains (e.g., Solana, BNB Chain).

2. **Lending Platform Integrations:** Integrate with DeFi lenders, enabling near-instant credit checks and partial blacklisting.

3. **Validator & Developer Incentives:** Distribute network rewards and milestone-based grants.

Phase 3: Global Expansion (12–24 Months)

1. **COSINE Lending DAO:** Transition governance to a DAO for strategic partnerships, including real-world banks and fintech.

2. **Open Lending Framework:** Provide widely accessible APIs for developers to build new financial products on top of COSINE.

3. **CEX Listings & Adoption:** Seek listings on top centralized exchanges, expand user base, and form new ecosystem collaborations.

Phase 4: Full Ecosystem (24+ Months)

1. **On-Chain Governance:** Hand over most protocol parameter decisions to on-chain voting, ensuring full decentralization.

2. **Integration with Traditional Finance:** Work with legacy credit bureaus, banks, and governments, bridging off-chain data to further refine risk assessments.

3. **Research and Optimization:** Continuously update the protocol's self-tuning mechanisms to adapt to evolving threat landscapes and new market needs.

11 Long-Term Vision

By creating a universal "trust layer" for all digital assets, COSINE envisions a future where:

- **Security** is embedded at the core of every DeFi product, instilling confidence in everyday users.

- **Global Lending Access** allows trustworthy borrowers anywhere to tap into credit, promoting financial inclusion and rewarding good behavior.

- **Lower Barriers to Innovation** encourage entrepreneurs to build novel financial platforms without worrying about building trust from scratch.

- **Wider Adoption of Digital Assets** as a stable means of exchange for commerce, remittances, and more, not just speculation.

Conclusion

Decentralized finance has tremendous promise, but it is undermined by systemic fraud, fragmentation, and outdated security models. **COSINE** offers a dynamic, self-tuning, and cross-chain solution that evolves with the network to mitigate risks and provide a real-time measure of trust.

By incorporating:

- **Adaptive Credit Scoring**,

- **Fraud Detection Across Chains**,

- **Sequential Voting & Reputation Systems**,

- **Cosine Similarity Verification**, and

- **An Efficient Fee Recoup Mechanism**,

COSINE positions itself as the go-to platform for secure, scalable DeFi solutions. Our vision is to empower anyone, anywhere, to transact with confidence and to expand financial opportunities by proving trustworthiness on-chain.

Contact: info@iwalink.ch | **Website:** cosinelayer2.com